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## X.

### *A History of the Fishes of Massachusetts.*

By DAVID HUMPHREYS STORER, M. D., A. A. S.

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*Continued from Vol. viii. p. 434.*

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#### ORDER II. PLAGIOSTOMI.

Gills fixed by their external edges, with five small external openings on each side. No opercle. Jaws represented by the palatine and postmandibular bones, which alone are armed with teeth. Pectorals and ventrals always present,—the latter, in the male, furnished on their internal margins with long appendages.

#### FAMILY XXVIII. SQUALIDÆ.

Body elongated, cylindrical. Tail thick and muscular. Eyes lateral. Branchial openings on each side, never underneath.

#### GENUS I. CARCHARIAS. Cuv.

One anal and two dorsal fins; the first dorsal placed over the space between the pectoral and abdominal fins. Jaws and head depressed. Teeth flat, pointed, and cutting; serrated in the upper jaw, sometimes in both jaws. No temporal orifices in adults, but rudiments may be observed in the foetus of some of the species.

#### CARCHARIAS GRISEUS, *Ayres.*

#### *The Gray Shark.*

(PLATE XXXVI. FIG. 1.)

*Carcharias griseus*, AYRES, Bost. Journ. Nat. Hist., iv. p. 293, pl. 12, fig. 4.

“ “ STORER, Synopsis.

*Color.* The anterior and upper parts of the body are of a dark ash color; sides lighter; beneath white.

*Description.* Body much more elongated than that of the *Lamna punctata*; its greatest depth, across from the origin of the dorsal fin, is equal to about one fifth the entire length of the fish. The length of the head is equal to about one seventh the entire length. The eyes are horizontally oblong,—their longest diameter one inch and a half; the distance between the eyes is three and a half inches. The nostrils are large, situated half way between the eyes and the tip of the snout; similar in form to those of the *Lamna punctata*. Numerous minute black points, the orifices of mucous pores, are distributed along the under surface of the snout. Mouth of moderate size, situated beneath. Three rows of elongated, sharp, smooth teeth, with a minute denticulation on each side, at their base, in each jaw; about twelve teeth on each side of the median line,—those toward the angle of the mouth the smallest. The tongue is large, fleshy, smooth. The posterior of the branchial orifices is situated just anterior to the base of the pectoral fins.

The lateral line is scarcely discernible.

The first dorsal fin arises upon the anterior half of the body, nineteen inches posterior to the tip of the snout. It is slightly convex upon its anterior edge, rounded above, emarginated posteriorly. A portion of its base is free.

The second dorsal is situated about six inches back of the first, of the same form, and but a very little smaller than that fin.

The pectorals are broad and stout, and as high again as long.

The ventrals are semiquadrate; they are just back of the termination of the first dorsal fin; the distance between the ventrals and anal is less than the length of the ventrals.

The anal fin is of the form and size of the second dorsal, and arises on a line opposite the termination of that fin.

About three inches back of the second dorsal, the body terminates in a slight protuberance, directly back of which is a depression from which commences the caudal fin. This fin is thirteen inches in length; at its anterior inferior margin, it is similar in form to the dorsal and anal fins; this portion is rounded at its inferior posterior margin, emarginated upon its posterior edge, and is continued gradually elongating, its inferior edge being a mere fringe, and terminates within three inches of the extremity of the tail, which dilates into a triangular portion.

The specimen above described measured three feet and eleven inches.

Length, four feet.

*Remarks.* This species was first described and figured by Mr. William O. Ayres from

a specimen taken in Long Island Sound, on the north shore of Brookhaven. It is uncommon in our waters.

Massachusetts, STORER. Connecticut, AYRES.

CARCHARIAS OBSCURUS, *Storer*.

*The Dusky Shark.*

(PLATE XXXVI. FIG. 2.)

*Squalus obscurus*, *Dusky Shark*, LESUEUR, Acad. Nat. Science 1, p. 223, pl. 9.

*Carcharias obscurus*, " " STORER, Report, p. 184.

" " " Bost. Journ. Nat. Hist., II. p. 558.

" " DEKAY, Report, p. 350, pl. 61, fig. 201.

" " STORER, Synopsis.

*Color.* Above, a dark yet vivid blue, somewhat banded by lateral lines, yet gradually passing into the pure white of the abdomen; this tinge of the back extends low upon the sides. Upper part and sides of head, as well as caudal and most of dorsal fins, of a delicate steel color with coppery reflections. Pectorals above, very dark green; beneath, a dull white. Posterior border of dorsals covered with a black mucous slime. Pupils dark brown, irides golden.

*Description.* Body tapering gently posteriorly; its greatest depth, midway between the pectorals and the first dorsal fin, equal to a little more than one seventh the entire length. Head elongated, sharp, flattened above and below. Snout throughout studded with mucous pores arranged in lines or at random, some of which are very large. The length of the head is equal to little more than one sixth the length of the body; its greatest depth is about one third its length, and nearly equal to its greatest width. Eyes large; their longest diameter, the longitudinal, equals about one quarter the distance between them. Nostrils situated on the outer edge of the lower surface of the head, not quite midway between the eyes and end of the snout, nearer the eye, double; the anterior and outer, a narrow slit, entering downwards and inwards; the posterior, nearly circular. Mouth not very large; the outer edge of the upper jaw just beneath the centre of the eye; its outer angle about one third the distance between the eye and pectorals. Both jaws armed with short, triangular, and serrated teeth; those in the upper jaw curved backwards; in each jaw a single row behind, a double row in front. Branchial apertures, five, comparatively small; the posterior two just above the anterior margin of the pectorals.



The lateral line is indistinct, — high up on the back; mucous pores somewhat similar in appearance, scattered throughout upper back.

The first dorsal fin is small and subquadrangular; its height equalling its length; and each about one third the length of the head.

The second dorsal is very small, about one third as large as the first, from which it also differs in another respect, its posterior margin being the longer; whereas in the first it is the anterior. It is situated posterior to the middle point between the first dorsal and caudal fin.

The pectorals are very large; their length is nearly four times their height, reaching beyond the middle of the first dorsal, — triangular, slightly falciform; the apex and posterior angle being rounded. These fins are situated just posterior to the middle point, between the end of the snout and the first dorsal.

The ventrals are moderate sized; height and length about equal; placed on a line about midway between the first and second dorsals.

The anal fin is small, of the size of the second dorsal, and of same form as that fin, save that its anterior border is slightly more rounded, and its margin more deeply cleft directly beneath that fin.

The caudal fin is slender, elongated, about two ninths the entire length. The upper lobe is little more than twice as long as the lower, and less stout; the preceding carinæ but little marked; a well marked notch above and below, before the caudal.

Length, nine to ten feet.

*Remarks.* The specimen described by me in the Boston Journal of Natural History was captured at Nahant, July 10th, 1839, and measured nine and a half feet. The one above described was sent to me from Provincetown, by Captain Atwood, October 30th, 1851. This is not a common species in the waters of Massachusetts. It sometimes floats ashore in the night, like the Goose-fish, — *Lophius Americanus*, — or becomes entangled in mackerel-nets, like the mackerel shark — *Lamna punctata*.

Massachusetts, STORER.

CARCHARIAS VULPES, *Cuv.**The Thresher. Fox Shark.*

(PLATE XXXVI. FIG. 3.)

*Squalus vulpes*, GMEL., LIN., Syst. Nat. i. pt. 3, p. 1496.*Long-tailed Shark*, PENN., Brit. Zoöl., III. p. 110, pl. 14.*Squalus vulpes*, *Fox Shark*, SHAW., Gen. Zoöl., v. p. 333.*Carcharias* " " " or *Thresher*, GRIFFITH'S, CUV., x. p. 599.*Thresher*, MITCH., Medical Repository, VIII. p. 77.*Squalus vulpes*, *Thresher or Long-tailed Shark*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., i. p. 482." " *Sea Fox or Thresher*, JENYNS, Brit. Vert., p. 498.*Carcharias vulpes*, *Fox Shark*, STORER, Report, p. 182.*Alopias vulpes*, *Sea Fox, Thresher, Sea Ape*, YARREL, Brit. Fishes, 2d edit., II. p. 523, fig.*Carcharias* " *Thresher or Fox Shark*, LINSLEY, Cat. of Fishes of Connecticut.*Carcharias vulpes*, *Thresher Shark*, DEKAY, Report, p. 348, pl. 61, fig. 199.*Alopias vulpes*, STORER, Synopsis.

*Color.* All the upper part of the body, together with the fins, a dark bluish lead; beneath white. Pupils blue-black, edged with golden.

*Description.* Surface of the skin rough when hand is passed toward the head. The depth of the body, at the origin of the dorsal fin, is equal to a little more than one eighth of the length of the fish; the length of the tail, from its origin to its extremity, is rather more than one half the entire length of the fish; the distance from the tip of the snout to the origin of the dorsal fin nearly one fifth the length of the fish. Length of the head, from the tip of the snout to the first branchial aperture, nearly equal to the greatest depth of the body.

Occiput slightly convex. Eyes situated vertically, very movable in their sockets. In the specimen now before me, a female, their longest diameter is one seventh the length of the head; whereas in a male specimen I formerly described, it was about one tenth the length of the head. Snout blunted; distance from its tip to the mouth two thirds of the length of the head. Gape of mouth moderate; three rows of very small teeth in each jaw, smooth on their edges; the two first rows nearly perpendicular, the back row recurved; teeth in the upper jaw rather the longer. Nostrils beneath, nearer the mouth than the snout. Five branchial apertures placed vertically, the posterior the smallest.

The body of this fish is terminated on the back by a slight ridge; just back of this, is a depression between it and the tail, at the origin of which is quite a concavity.

The first dorsal fin is triangular, as long as high; convex anteriorly, rounded above.

The second dorsal is a mere finlet, quadrangular, with its posterior superior angle projecting backwards.

The pectorals are large, stout, falciform; their posterior bases are free.

The ventrals are shaped like the first dorsal, and are of the same length.

The anal fin is of the same size and form as the second dorsal, and is situated just posterior to it.

The caudal fin is very strong and powerful; its inferior base is triangular; back of this portion it gradually diminishes in thickness and terminates obtusely; just anterior to the extremity of the tail, upon its inferior edge, is a small triangular portion. A fleshy membrane margins the entire inferior edge of this fin.

Length, twelve to fifteen feet.

*Remarks.* This species, which sometimes weighs from one hundred and fifty to two hundred pounds, is known by our fishermen as the *Thresher* or *Swingle-tail*, from the motions of its tail, which is often used with great force. It is met with in our waters in summer, not often however, pursuing mackerel and manhaden, upon which it feeds. Small numbers are yearly captured in the fall of the year in nets set for mackerel, and occasionally a specimen is taken with the hook while fishing for dog-fish. When thus caught, it is secured with much difficulty on account of the constant and powerful thrashing of its tail.

This fish is considered almost valueless. Its liver, however, contains a small quantity of oil, and when an individual is accidentally taken, this is preserved and sold with the oil from the livers of other species.

Massachusetts, STORER. New York, MITCHILL, DEKAY.

CARCHARIAS ATWOODI, *Storer.*

*The Man-eater Shark.*

(PLATE XXXVI. FIG. 4.)

*Carcharias Atwoodi*, STORER, Proceed. Bost. Soc. Nat. Hist., III. p. 72.

*Color.* A leaden gray upon back and sides, and white beneath. The lower portion of the tips and edges of the pectorals are black.

*Description.* Depth across from the origin of the dorsals, twenty-three inches; across from the origin of the pectorals, twenty-six inches; across from the first branchial orifice, twenty-five inches; across from the extremities of the ventrals, fourteen inches; from the tip of the snout to the first branchial orifice the distance is equal to the greatest depth of the fish. The cheeks are very prominent. The eyes are perpendicularly oblong, their greatest diameter being two inches, their shorter diameter an inch and a half;

the distance between the eyes is eleven inches ; the distance from the eyes to the tip of the snout is ten inches. The nostrils are situated three and a half inches in front of the eyes, and six inches from the tip of the snout. The gape of the mouth is very large. Both jaws are armed with five rows of large, triangular, serrated teeth,—the front teeth of the upper jaw about an inch and a quarter long ; toward the angles of the jaw they are smaller. The teeth in the lower jaw are less wide than those of the upper. About twenty-five teeth can be counted in each row.

The branchial apertures vary from twelve to fifteen inches in length.

The first dorsal fin is just back of the pectorals ; it is eighteen inches high, measured over its outer edge, and thirteen inches long, four inches of its base being unattached ; it is slightly emarginated posteriorly.

The second dorsal fin arises thirty-one inches back of the posterior edge of the first dorsal. This fin is four inches high and five inches long, three and a half inches being unattached.

The pectorals are thirty-two inches high, and rounded over their outer edge ; they are fourteen inches long at their base, six inches of which are unattached.

The ventrals are eight inches high at their outer edge, three at their middle, and five at their posterior portion. They are nine inches long at their base, four inches of which are unattached.

The anal fin arises eleven inches posterior to the extent of the ventrals, on a line opposite the posterior portion of the second dorsal ; it is three and a half inches high, and five inches long at its base, three inches of which are unattached ; its posterior edge is highly emarginated.

Just anterior to the caudal fin, upon the dorsum, is a groove two inches across, and half an inch deep ; beneath this, upon each side, a prominent carina passes to the base of the caudal fin.

The caudal fin is large and strong ; it measures thirty-three inches over its upper lobe, and twenty-six over its inferior lobe ; eight and a half inches anterior to the tip of the larger lobe is a small triangular posterior. This fin measures thirty-three inches across from the tip of its lobes.

The specimen here described measured twelve feet eleven inches in length, and weighed about fifteen hundred pounds.

Length, thirteen feet.

*Remarks.* That this is an exceeding rare species along our coast, is obvious from the fact that I can learn of but three individuals having been seen by our fishermen during

the last fifty years. One of these measured six feet; a second, nine feet; the third, thirteen feet. My specimen was captured at Provincetown, June 16th, and was brought to this city for exhibition. When first seen, it was swimming in about ten feet of water on the Long-Point side of Provincetown harbor. A boat's crew having given chase, a harpoon was thrown into it, when it instantly turned toward the boat, and seized it with great ferocity near the bows, in which act several of its teeth were broken off. It was eventually killed by being frequently lanced.

I know of no species which resembles this, unless it be the great white shark, — *carcharias vulgaris*, — and it certainly cannot be identical with that. When I presented the generic characters of this species to the Boston Natural History Society, October 18th, 1848, I made the following remarks: "The absurd notion of indiscriminately annexing the names of individuals to objects of Natural History has been almost discarded, unless in cases where the persons so specified have in some way advanced the boundaries of science. In the instance before us, I feel you will all agree with me in acknowledging that the compliment here offered is deserved, when I remind you that the hardy fisherman referred to, while constantly engaged in the fatigues of his exceedingly laborious profession, has transmitted me within the last two seasons, besides the species here described, a species of *Blennius* and *Motella*, both of which genera were new to our waters; besides a specimen of the *Somniosus brevipinna*, previously only known by a description of a stuffed specimen met with by Lesueur, at Marblehead, thirty years ago; and a specimen of *Aspidophorus monoptygius*, never but once previously met with south of Greenland; without referring to numerous specimens of our most common species. I would at the same time reiterate, what you have repeatedly heard me state, that he is more conversant with the history and habits of the fishes north of Cape Cod, than any individual with whom I am acquainted, or in other words that he is our best practical ichthyologist." Eighteen years have elapsed since the above words were spoken, and my debt to the individual referred to has immensely increased, and can never be repaid. Whatever other genus this species may be hereafter arranged in, whether it be *Carcharodon* or some one yet unformed, unless it be ascertained to have been previously described, I implore succeeding ichthyologists to hesitate before they expunge it. Let his name, who has done so much to enable me to present this final report on the fishes of Massachusetts, be indelibly associated with the science to which he is an honor.

Massachusetts, STORER.

## GENUS II. LAMNA, Cuv.

Muzzle pyramidal, under the base of which are the nostrils. Branchial apertures all in front of the pectorals.

LAMNA PUNCTATA, *Storer*.*The Mackerel Shark.*

(PLATE XXXVII. FIG. I.)

*Squalus punctatus*, *Green-backed Shark*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., 1. p. 483.

*Lamna punctata*, *Mackerel Shark*, STORER, Report, 185, pl. 3, fig. 2.

" " " " " Bost. Journ. Nat. Hist., II. p. 534.

" " *Mackerel Porbeagle*, DEKAY, Report, p. 352, pl. 63, fig. 206, 207.

*Lamna punctata*, *Mackerel Shark*, STORER, Synopsis, p. 252.

*Color.* All the upper part of the body is greenish, which becomes of a slate color after death; lighter upon the sides; white beneath. Pupils black, irides dusky.

*Description.* Head small, its length is nearly equal to one seventh the length of the entire fish. Eyes nearly circular, very movable in their orbits; distance between the eyes equal to three times their diameters. Nostrils large, in front of eyes and inferior to them; the posterior opens forward, and is the larger; a semicircular groove passes forward and downward to the inferior which opens posteriorly. On a line above the eyes, are seen a series of mucous pores, resembling black orifices, running toward the snout; another series between the eyes and the snout. These are also distributed upon the under portion of the snout. Each jaw is furnished with three rows of small, sharp, triangular teeth, smooth at their edges; the two first rows straight, the back row recurved; the three teeth on each side of the middle of the lower jaw, the largest. Tongue large, rough, fleshy. Five large branchial apertures situated vertically; the distance between the anterior greater than that between the posterior. The depth of the fish, in front of the dorsal fin, is less than one quarter the length of the fish; the distance from the extremity of the snout to the dorsal fin is less than one third the length of the fish.

The first dorsal fin is somewhat triangular, with a fleshy horizontal process pointing backward from its base posteriorly, higher than long, emarginated posteriorly, rounded above.

The second dorsal fin is adipose, rhomboidal; its height is equal to one fourth the length of the first dorsal.

The pectorals are quite strong, falciform, higher than the length of the head, and connected posteriorly by a membrane to the body.

The semiquadrate ventrals are situated far back on the body; anus large, situated between the ventrals.

The anal fin is formed like the second dorsal, and is opposite it.

A double series of mucous pores point out the lateral line. On a line with the origin of the second dorsal fin, continuous with the lateral line, a wide carina runs on each side to the centre of the tail. The space between the second dorsal and the tail is equal to the length of the pectorals; at the posterior portion of this space is a crescent-shaped ridge with a groove behind.

The lobes of the caudal fin are unequal; the upper is much the larger, with a slight emargination at the superior posterior portion. This emargination is not referred to by Dekay in his description; and it is omitted in his figure. The specimen which I described in my "Report," measured eight feet, and near its anus, embedded in the flesh, was a specimen of the "*Anthosoma Smithii*" — Leach.

Length, three to ten feet. Weight, between two and four hundred pounds.

*Remarks.* This is the most common species of shark found in Massachusetts. It is met with during the summer and autumn. The fishermen are much annoyed by having their hooks and lines bitten off by this species while fishing for cod and mackerel, and their nets seriously injured, and not unfrequently ruined by them, while fishing for the latter species. It is more plenty upon some portions of the coast of Maine than in our bay. Captain Atwood informs me that while he was fishing for mackerel with nets at Monhegan, Maine, in September, 1845, his boat's crew of four men took twelve individuals; and another boat's crew of six men captured nineteen in a single night; and he adds, he should judge that one hundred and fifty at least, were taken during three weeks he continued to fish there. Except for the oil furnished by this species it is worthless to the fisherman. Seven gallons of oil are frequently extracted from the liver of a single fish, and eleven and a half gallons have been taken from one. Of late years this fish has yielded less oil than formerly, so that they are now scarcely thought worth saving. Formerly, a barrel of oil was frequently made from the livers of eleven fish, and Captain Atwood tells me that, many years since, his father even procured a barrel of oil from eight livers; not selecting the largest but employing large and small indiscriminately; but now, at least one hundred livers would be required to furnish this amount of oil. So that the procuring oil from this fish, which was once a regular business, has been almost entirely abandoned. When this oil is carefully prepared by boiling the fresh liver,

it is less valuable than whale oil to burn. It is a usual practice, however, among the fishermen to mix all the common fish oils together, when they are sold in Boston market under the name of shore oil. The curriers use the greater portion of this oil. This species feeds upon many different kinds of fish; but as it is generally met with while following shoals of mackerel, it is generally known as the mackerel shark. At Provincetown, it is called blue shark.

Maine, Massachusetts, STORER. New York, MITCHILL, DEKAY.

### GENUS III. MUSTELUS, CUV.

Teeth blunt, forming a closely compacted pavement in each jaw; with temporal orifices. First dorsal in front of the ventrals. Lower lobe of the caudal short. No spines.

#### MUSTELUS CANIS, *Dekay*.

#### *The Smooth Hound.*

(PLATE XXXVII. FIG. 2. 2 a. Head beneath.)

*Squalus canis*, *Dog-fish*, MITCHILL, Trans. Lib. and Phil. Soc. N. Y., i. p. 486, pl. 64, fig. 209.

*Mustelus canis*, *American Hound-fish*, DEKAY, Report, p. 355, pl. 64, fig. 209.

" " STORER, Synopsis, p. 253.

*Color.* All the upper part of the body is of a uniform slate color; the sides are lighter; the abdomen of a dirty white.

*Description.* Of an elongated form, gradually sloping upward from just back of the eyes, to the origin of the dorsal fin, beyond which it tapers to the tail. Skin smooth. The individual before me, which is a male, is three feet and three inches in length; the width of the body at the ventrals, is five inches; the greatest height is at the origin of the first dorsal fin, about three inches. The length of the head is eight and a half inches; the distance between the eyes is two and a half inches. The head is flattened between the eyes, which are longitudinally oblong; their greatest length is one inch. The temporal orifices are just back of the posterior angle of the eyes, on a line with them. The mouth is large, triangular when closed. The teeth like those of the rays. At the posterior angle of the upper jaw, a fleshy prolongation, half an inch in length, projects backward. The snout is obtuse; the nostrils are large, situated just in front of the mouth, on the edge of the base of the snout, and are covered by a valve.

The lateral line is quite prominent throughout the greater portion of its extent, and is continued in a straight course to the tail.



The first dorsal fin is subquadrangular, rather longer than high, deeply emarginated posteriorly, and terminating in an acute point.

The second dorsal fin is formed like the first, and is situated far behind it.

The pectorals are large and subtriangular.

The ventrals are subquadrangular; the claspers on each side of the ventrals are as long again as the fins themselves.

The anal fin is of the same form as the second dorsal, but smaller; it arises beneath the middle of that fin, and extends beyond it.

The caudal fin commences by a small elevation or crest, the prolongation, as it were, upwards of the cuticle, gradually becomes higher and is rounded at its posterior extremity; beneath, at its posterior extremity, is a triangular portion, which is partially separated at its base by a small fissure from the anterior portion, which is of a more elongated form.

Length, two to four feet.

*Remarks.* This species, which is called by the fishermen of Massachusetts Bay the smooth hound from its smooth skin, and dog-fish from its general resemblance to the dog-fish shark, I had not seen when my report on the fishes of Massachusetts was published. Since then I have examined several specimens taken in our bay and at Holmes Hole. This species sometimes runs ashore in great numbers. It is more numerous south of the Cape. Its liver yields about as much oil as that of the *Acanthias Americanus*. The largest I have met with measured forty-six inches.

Massachusetts, STORER. New York, MITCHILL, DEKAY.

#### GENUS IV. SELACHUS, Cuv.

Two dorsal fins, — the first placed but little behind the line of the pectorals, the second over the interval between the ventral and anal fins. The skin rough. Snout short and blunt. Temporal orifices very small. Teeth very small, numerous, conical, edges smooth, no lateral denticles. Branchial openings large, nearly encircling the neck.

## SELACHUS MAXIMUS, Cuv.

*The Basking or Elephant Shark.*

(PLATE XXXVII. FIG. 3.)

- Squalus maximus*, LIN., Sys. Nat. i. p. 400.  
 " " *Basking Shark*, PENN., Brit. Zoöl. p. 134, pl. 16.  
 " " SHAW, Gen. Zoöl. v. p. 327, pl. 149.  
 " " FABRICIUS, Fauna Greenlandica, p. 130.  
 " " *Basking Shark*, JENYNS, Brit. Vert. p. 503, sp. 193.  
*Squalus peregrinus*, BLAINVILLE, Ann. du Museum, xviii. pl. 6, fig. 1.  
*Squalus maximus*, *Basking Shark*, MITCH., Trans. Lit. and Phil. Soc. of N. Y. i. p. 486.  
*Squalus elephas*, LESUEUR, Journ. Acad. Nat. Soc. ii. p. 243, pl.  
*Squalus* (*Selachus*) *maximus*, CUV., *Basking Shark*, RICH., Faun. Boreal, Americ. iii. p. 291.  
*Selachus maximus*, *Basking Shark*, *Sun-fish*, *Sail-fish*, YARRELL, Brit. Fishes (2d edit.) ii. pl. 518, fig.  
*Selachus maximus*, GRIFFITH, CUV. x. p. 603.  
*Squalus elephas*, LES., STORER, Report, p. 407.  
*Selachus maximus*, *Basking Shark*, DEKAY, Rep. p. 357, pl. 63, fig. 208.  
 " " STORER, Synopsis.

*Color.* The whole upper part of the body of a dark slate color; lighter beneath. Mouth white, mottled with fuliginous.

*Description.* The surface of the body throughout, divided into innumerable rugæ which are covered with minute sharp points, often collected into groups, resembling the discs of many of the echini, upon which are situated the spines by which they are ornamented; or, still more, the tubercles along the lateral line of some of our cotti, causing the skin to be exceedingly rough.

From the tip of the snout to the first branchiæ, four feet nine inches. Five very large branchiæ nearly surrounding the head, as the animal is lying; the first pair of branchiæ are separated on the neck, from each other, six inches; the second pair are separated, at the same situation, nine inches; the third pair, one foot three inches; the fourth pair, one foot nine inches; the fifth pair, two feet three inches; showing the first interval to be much the largest. The head is small; perfectly smooth for the most part in front of the eyes, and covered with circular and oblong mucous pores, which keep this portion constantly lubricated. Snout blunt. Nostrils five inches in front of the eyes, the lower portion upon the edge of the upper lips. Eyes very small; their diameter three inches; largest circumference of sclerotic coat when removed from the socket, eight and a half inches. Eyes very movable in their orbits; distance between the eyes two feet; distance between the tip of the jaws, as artificially raised, two feet; this vertical gap is undoubtedly as much again at least, in the living fish, which gives an opening of four feet.

Jaws furnished with a great number of small, incurved, pointed teeth. Six rows of these in the upper jaw, and seven rows in the lower jaw; the inner row in this jaw are hardly formed; each of the rows in this jaw, as I counted them in the mouth, contained one hundred teeth from the tip to the angle of the jaw, or two hundred, as counted from one angle to the opposite one; or, in a word, fourteen hundred teeth in this jaw. The teeth are conical, sharp, polished, with a sensible ridge upon each side, often roughened, almost serrated; the lower portion of the tooth striated; the teeth at the angles of the jaws, short and more compressed. The teeth in the centre of the jaw are three lines high above the jaw, and their base or root about the same length within the socket. Temporal orifices small; just back of the angle of the jaws.

The first dorsal fin is triangular; two feet ten inches long, four feet four inches high anteriorly, three feet posteriorly; distance between the first and second dorsal fins, six feet.

The second dorsal fin is ten inches long, sixteen high anteriorly, thirteen posteriorly.

The pectorals are falciform; one foot nine inches long, five and a half feet high; distance between pectorals and ventrals, eight feet.

Length of the ventrals, one foot eleven inches; height, two feet nine inches; length of the claspers, three feet three inches; width at their base, eight inches, from which they gradually pass to a point; they enclose a strong bony spine.

The anal fin commences opposite the second dorsal; its length is eleven inches, its height fourteen inches; across the top, ten inches; distance between the anus and the anal fin, three and a half feet.

Anterior to the caudal fin is a lunated depression; above and beneath the posterior extremity of the fish, at the base of the tail, is a carina upon each side, one foot eight inches long. The caudal lobes are unequal; the upper lobe, six feet six inches in length, measured over its curve, having at its extremity a small triangular lobe; the lower lobe, four feet two inches, measured in the same way; width of the extremity of the lower lobe, six inches; width at the base, two feet two inches; width of the extremity of the upper fluke or lobe, one inch; width of the base, two feet three and a half inches; from the lunated depression to the middle of the fin, two feet eleven inches.

Length, thirty-six feet.

*Remarks.* The specimen above described, measured thirty feet and three inches. It was harpooned in the harbor of Provincetown, in 1839, and being towed to Chelsea, was there exhibited. I visited it with my friend, Jefferson Wyman, M.D., who made a figure, while I prepared the description which accompanied my "Report," which I

have here transcribed, not having been able to see a second specimen. When I saw the fish, it was lying upon the beach, where it was entirely exposed at low tide, and nearly, if not altogether, covered by water when the tide was high. The tide was flowing in when I examined it, which compelled me to make a more rapid survey than could have been wished. It had been opened, and its viscera were removed. The liver filled eight barrels, and furnished six barrels of oil.

Among our fishermen this species is known as the Bone Shark. It is rarely observed on our coast, and when taken is generally harpooned. For my knowledge of it in our waters, I am almost entirely indebted to my old and tried friend, Capt. Atwood. Within his remembrance he has known but three to be captured in nets. In 1835, an individual became entangled in a mackerel-net, and was then harpooned. In 1836 or 1837, a second was caught in a net; and after being drowned, its carcass was freed by the fishermen from the net, and it afterward drifted ashore in a state of decomposition. After lying upon the beach several days, a fisherman visited it for the purpose of procuring a slice for his hens, as is the custom at Provincetown, he supposing it to be a dead whale. Ascertaining what the animal was, he removed the liver and sold the oil in Boston for *one hundred and three dollars*, it having produced five or six barrels of oil. In 1847, a third was captured, then harpooned and drawn ashore.

In 1848, a vessel going to the coast of Maine for humpback whales, fell in with many of this species off Cape Elizabeth, and secured several of them. A tradition exists among the fishermen, that this species was taken in quite large numbers one hundred years ago, in the spring, for their oil.

This species was described and figured by Lesueur, from a specimen taken near New York, in 1822, as being previously unknown to naturalists, under the name of *Squalus elephas*. The specimen seen by Lesueur was afterward examined by Dekay, who has given us Lesueur's figure with some alterations; having been taken from a preserved specimen it fails to give some of its characteristics. Some of the figures of this fish, found in different works of natural history, are exceedingly unnatural. This fact is thus accounted for by Yarrell in his description of the species: "The difficulty of obtaining a perfect view of this unwieldy fish, either when floating in water, or when, from its great weight, it lies partly imbedded in the soft soil of the sea-shore, has led to the differences which appear in the representations of it which have been published by different naturalists."

Greenland, FABINIUS. Massachusetts, STORER. New York, MITCHILL, DEKAY. New Jersey, LESUEUR.

## GENUS V. ACANTHIAS. RISSO.

Two dorsal fins, with a spine before each; first dorsal behind the line of the pectorals; the second dorsal over the space between the ventral and caudal fins; no anal fin. Skin rough in one direction; the scales heart-shaped, with a central spine directed backward. Temporal spiracles large. Several rows of teeth in both jaws, cutting and sharp, the points directed outward and backward.

ACANTHIAS AMERICANUS, *Storer*.*The Dog-fish.*

(PLATE XXXVIII. FIG. 1. 1 a. Jaws.)

*Spinax acanthias*, *Picked Dog-fish*, STORER, Report, p. 187.

" " *Spinous Dog-fish*, DEKAY, Report, p. 359, pl. 64.

" " *Dog-fish*, AYRES, Bost. Journ. Nat. Hist., iv. p. 289.

*Acanthias americanus*, STORER, Synopsis, p. 506.

*Color.* All the upper part of the body is of a slate color, which is deeper upon the head, and lighter below the lateral line. Body beneath, white; a row of circular white spots are situated just under the anterior portion of the lateral line, and a few similar spots are irregularly distributed upon the back; these spots, in some specimens, are arranged with much more regularity than in others. The young of this species are much more spotted than the adults. In several fetuses I have examined, there have been noticed several white spots on the tops of the shoulders,—two in front of, and two just behind, the first dorsal fin; also spots on the sides, which, becoming confluent, form a white band extending almost the whole length of the body.

In a male specimen, twenty-three inches in length, I could scarcely observe a spot upon its entire surface.

*Description.* Body elongated, cylindrical, with a slight ridge on the back, which is more perceptible between the dorsal fins. A distinct carina on each side of the abdomen, posterior to the second dorsal fin. The entire surface is rough. The head, which is flattened above, and tapers to a blunted snout, is equal to one seventh the entire length of the fish. The eyes are horizontally elongated; the pupils are small, black; the irides are silvery with a cupreous tint. The orbits are large, allowing great motion to the eyes. The distance between the eyes is equal to more than one half the length of the head. The temporal orifices are back of, and just above, the posterior angles of the

eyes; they are furnished anteriorly with a cartilaginous valve; their length is equal to the short diameter of the eyes. Between the eyes, are two longitudinal patches of numerous mucous pores, which are indistinctly continued nearly to the extremity of the snout. All the lower portion of the head, in front of the mouth, is covered with similar mucous orifices, which, like those just mentioned, exude, when pressed, a gelatinous secretion. The nostrils are double, and are situated nearer to the eye than to the snout; the outer orifice is circular, the inner transverse; they are situated transversely with regard to each other. The mouth is moderate, nearly circular when expanded. In the upper jaw, are three rows of teeth; in the lower jaw, are two rows; these teeth have very sharp edges, and their points are turned outwardly from the centre of the jaw. The tongue is large, rounded at its tip, and, like the whole interior of the mouth, is white. The branchial orifices, five in number, are situated directly in front of the pectoral fins; the posterior is rather the largest.

The lateral line, which is situated on the upper half of the side, pursues nearly a straight course to the extremity of the fleshy portion of the tail, from whence it passes obliquely upward to the outer edge of the fin.

The first dorsal fin arises on the anterior third of the body; it is convex before, emarginated above, and terminates posteriorly above in an acute angle. A strong triangular spine, almost black at its base and white at its tip in some specimens, nearly half the height of the fin, arises at its anterior base, and is concealed in nearly half its height by the fin.

The second dorsal fin of the same form as the first, but much smaller, is situated back of the first dorsal, at a distance from it equal to one fourth the whole length of the fish. A spine similar in its form and situation to that in the first dorsal, but nearly as high as the fin itself, is also here observed.

The pectorals are large, subtriangular, emarginated posteriorly; they commence at the last branchial orifice, their length is rather less than half their height. The ventrals are small and subtriangular; they are situated just anterior to the second dorsal, with the anus between them.

The caudal fin is very large and powerful; its upper portion is broad, and as long again as the lower.

Length, one to three feet; weight, eight to fifteen pounds.

*Remarks.* In the Spring and Autumn, this species makes its appearance in shoals in our bay; they are frequently met with in immense numbers. These shoals seldom remain in shallow water, or near the shore more than three or four days. They feed upon

mackerel and other fishes, and also upon the offal and garbage thrown upon the bottoms by the fishermen.

It is usually caught with the hook. On account of the sharpness of the teeth of this species, an ordinary line will not answer, as it would be severed at once; so that beneath the lead or sinker is suspended a piece of twisted line eight or nine inches in length, to which is attached, by a swivel, a firm leathern thong about twelve inches long on each side, supporting at each extremity a small chain about six or eight inches in length, each bearing a hook. Although it is not taken in quantities through the summer along the shore, yet so late as June 27, 1847, I noticed along the entire beach of Long Point, Provincetown, wherever the fishermen had cleared their nets of the Whiting they had caught the previous night, that more or less of this species also had been thrown away.

At their first appearance in May, they are quite abundant for about a fortnight at Chilmark, Martha's Vineyard, and the inhabitants take them in large quantities for their oil. During the spring of 1846, so numerous were they about Gay Head, that in half of a day, six hundred dog-fish were caught by the crew of a single boat by the hook. When this species comes into Massachusetts Bay in the early part of June, it tarries but for a few days; and as the fishermen at Provincetown are engaged in taking mackerel, they pay no attention to it at that time. But when they again appear in September, to remain until the middle of November, the fishermen being more at leisure, fit out their smacks for the sole purpose of capturing them for their livers. About one thousand livers furnish a barrel of oil, which is worth twelve dollars. When the livers are preserved, without being tried out, they are sold for about four dollars per barrel. After the fishery is over, the oil is boiled out of the livers and it is prepared for the market, where it will be worth from twenty-five to thirty cents per gallon; it is not very salable however, in cold weather, as it frequently becomes very hard when cold. The oil from this species is of an inferior quality, and is readily detected by its odor and lighter color; so that if a small quantity of dog-fish oil is mixed with shore oil it is condemned by the speculators. This shore oil is used by the tanners and curriers; it is prepared by putting the livers in barrels or butts in the sun; in a short time the water separates and sinks, and the oil is dipped out.

The fish itself on some parts of Cape Cod was formerly dried for fuel, and its skin was considerably used for polishing, by the mechanic.

These are some of the benefits derived from this species: but, upon the whole, those fishermen who catch mackerel in nets consider them very unwelcome visitors, as they not unfrequently swim near the surface of the water during the night and devour large

quantities of mackerel entangled in the nets, by biting them in pieces; they also become themselves entangled in the nets, and by their teeth and rough skin nearly destroy them.

Northerly, beyond the coast of Labrador, DEKAY. Massachusetts, STORER. Connecticut, AYRES. New York, DEKAY.

#### GENUS VI. SCYMNUS. Cuv.

All the fins small; two dorsal fins, the first but little before, and the second but little behind the line of the ventrals; no anal fin. Skin rough. Temporal orifices or spiracles large, placed rather high upon the head, above as well as behind the eyes. Teeth in the lower jaw crooked at the point, equilateral at the base; in the upper jaw lancet-shaped, but little curved; the points in both jaws diverging from the centre. Gill openings small.

#### SCYMNUS BREVIPINNA, *Dekay*.

##### *The Nurse or Sleeper.*

(PLATE XXXVIII. FIG. 2. a. Teeth of upper jaw. b. Teeth of lower jaw. c. Spine in skin.)

*Somniosus brevipinna*, *Nurse or Sleeper*, LESUEUR, Journ. Acad. Nat. Sciences, I. p. 222, pl.

" " " " STORER, Report, p. 189.

*Scymnus brevipinna*, *Nurse*, DEKAY, Report, p. 361. pl. 61. fig. 202.

" " " STORER, Synopsis, p.

*Leiodon echinatum*, WOOD, Proceed. Bost. Soc. Nat. Hist., II, p. 174.

*Color.* A purplish gray, with numerous white spots distributed over its surface.

*Description.* Body robust, subtriangular to the posterior line of the first dorsal fin, slightly convex in front of the dorsal fin, posterior to which it is cylindrical, and rapidly diminishes in its diameter. The entire length of the specimen before us is seven feet nine inches, measured from the tip of the snout to the extremity of the upper lobe of the tail. The depth of the body, across from the first dorsal fin, is eighteen inches; the depth at the anal, is five inches; the depth at the origin of the tail is three inches. The length of the head is fourteen inches; it is elongated, and terminates in a blunted snout, which is rounded above, somewhat flattened beneath, and six inches deep at its base. The eyes are circular, one and a half inches in diameter, situated seven inches posterior to the tip of the snout. The nostrils are large, situated beneath the base of the edge of the snout, four inches anterior to the eyes.

The mouth is of moderate size; the upper jaw is covered with five rows of small,



sharp, incurved, lancet-shaped teeth. The lower jaw has two rows of broad, quadrangular teeth, divided in their centres by a perpendicular ridge, and having their apices armed with a horizontally subtriangular cutting edge, directed, on each side of the centre of the jaw, toward the angle of the jaw. There are about twenty-six teeth on each side of the centre of the jaw. The temporal orifices are small; they are situated rather more than three inches posterior and superior to the eyes. The branchiæ, about two and a half inches in length, are eight inches back of the eyes. The entire surface of the body, including the fins, is thickly covered with minute conical recurved spines; these spines are grooved longitudinally, particularly upon their convex surfaces.

The lateral line is scarcely perceptible in the recent fish, but is readily traced on the dried specimen: it is a somewhat irregular black line, which, arising above the eyes, and passing along the whole length of the body, is lost upon the upper lobe of the caudal fin; from its under edge pass downward numerous lines of about one quarter of an inch in length, of the same color as the line itself, separated about a half inch from each other.

The first dorsal fin is subtriangular, — eight inches high from its base to its posterior tip; three inches long; the posterior portion of the fin is prolonged three inches beyond the base.

The second dorsal fin arises twenty inches back of the first; it is three inches high and eight inches long at its base; its posterior portion is elongated five inches beyond the base.

The pectorals are situated thirteen inches back of the angle of the jaws; their height is eleven inches, their length six inches, — they are rounded posteriorly.

The ventrals are subquadrangular, and are situated just in front of the second dorsal fin; their height is six inches, their length five inches, their posterior prolongation three inches in extent.

The caudal fin is emarginated; the height of the upper lobe is fifteen and a half inches; that of the lower lobe is twelve inches. The distance from the tip of the upper lobe to the lower edge of the lower lobe is twenty inches.

Length, eight to twenty feet.

*Remarks.* In the year 1818, Lesueur described and figured this species, from a stuffed specimen he saw at Marblehead. Never having been able to obtain a specimen, I was obliged to transcribe Lesueur's description into my "Report," published in 1839. Dekay followed my example in his "Report on the Fishes of New York," which appeared in 1842, in copying Lesueur; but not satisfied, with, to use his words, "an illy-constructed

genus," he referred the species to the genus *Scymnus*, which classification I accepted in my Synopsis.

A specimen of this species, sixteen feet in length, was taken on the coast of Maine, about eighty miles east of Portland, in August, 1846. After being skinned and stuffed, it was seen and described by William Wood, M. D., of Portland. He supposed it to be new, and called it *Leiodon echinatum*. His description appeared in the second volume of the "Proceedings of the Boston Society of Natural History." In the month of January, 1848, Capt. N. E. Atwood brought me, from Provincetown, a specimen he had taken the day previous while fishing for cod. I at once described it and had it figured, supposing it to be a new species. The accompanying description and figure give its characters while recent. When, however, it had been stuffed and dried, it proved to be Lesueur's species; its aspect being materially changed by the process of being skinned and preserved. Another specimen was caught at Nahant, in November, 1848. It was drawn upon the beach where it remained alive during the night. At its death it was brought to the city for exhibition. A third was harpooned at Provincetown in April, 1849, at Long Point, fifteen feet long; and still a fourth was taken on the 24th of April, the same year, at Provincetown, near the Long Point light-house. These are the only instances with which I am acquainted of its capture. I have learned from conversation with an intelligent fisherman, however, that individuals are captured every winter, and that it is more numerous than is generally supposed. Sometimes it is very large—measuring twenty feet in length, and weighing two tons or more, on these the cutaneous spines attain a great size. In the vicinity of Provincetown, its most common resort is near Race Point, in a gully famous for halibut and star-fish. The liver furnishes five or six gallons of oil—in one case, a single half lobe filled a flour barrel, and yielded fifteen gallons of oil. It is called by the fishermen *gurry* or *ground shark*, from its feeding on the offal which is thrown overboard from the smacks. It is sometimes attracted, like other species of sharks, by the carcasses of whales killed in Massachusetts Bay.

There is a description of a species of *Scymnus*, accompanied by a figure by Valenciennes in the "Nouvelles Annales du Museum," tom. i, 1832, which he calls *microp-terus*. The fish was taken near the mouth of the Seine. He considered it distinct from the dried specimen of Lesueur. There is a very strong resemblance, however, between the descriptions of the recent fish.

Massachusetts, LESUEUR, STORER.

## GENUS VII. ZYGÆNA. Cuv.

Head depressed, more or less truncated in front; the sides extend horizontally to a considerable length, with the eyes at the external lateral extremity. Teeth of the same shape in the upper and lower jaw, namely, the points directed toward the corner of the mouth, with a smooth edge when young, but distinctly serrated in adult specimens. Branchial openings, five. Two dorsal fins, — the first in a line close behind the pectorals; the second, over the anal fin.

## ZYGÆNA MALLEUS, Val.

*The Hammer-headed Shark.*

(PLATE XXXVIII. FIG. 3.) a. Head beneath.)

*Squalus Zygoena*, *Hammer-headed Shark*. Mitch. Trans. Lit. and Phil. Soc. of N. Y., i. p. 284.

*Zygoena Malleus*, VAL. Mem. du Mus. D'Hist. Nat. v. 9. p. 288., pl. 2, fig. a, 1, 6.

" " *The Hammer-headed Shark*, STORER, Bost. Journ. Nat. Hist. iv. p. 185.

" " VAL., *Synopsis*, p. 256.

" " DEKAY, Report, p. 362. pl. 62, fig. 204.

*Color.* The upper part of body a dark 'grayish brown, lighter on sides; beneath, white; posterior inferior parts of head, bluish; anterior margin of head tinged with white.

*Description.* Head somewhat rounded anteriorly, semicircular directly in front, with a smaller curve on each side of this, widely expanded and much compressed at sides. The external margin of the sides of the head rounded, having the eyes situated at their anterior extremity; the anterior angle in front of the eyes is very prominent. The width of the head is equal to twice its length, and is also about the length of the upper lobe of the caudal fin, and one fourth the length of the fish. The expanded sides of the head are two thirds the length of the head. The nostrils are situated beneath and front of this angle, in the extremity of an emargination that extends along the smaller curves previously mentioned. The posterior portion of the head is bordered by a stout, fleshy, and concave membrane. The eyes are large and prominent. The mouth is situated beneath; its posterior angles on a line with the posterior edges of the head. Several rows of sharp teeth are seen in each jaw, — their points are directed toward the sides, and have a prolonged base. Branchial apertures, five. The under surface of the head abounds in mucous pores, disposed in patches, the largest of which is of a triangular form, and directly in front.

The lateral line, which is quite indistinct, commencing on the side of the occiput, passes obliquely backward to a line above the third branchial orifice, and then assuming a straight line, runs the whole length of the body, and is lost upon the posterior extremity of the caudal fin.

The first dorsal fin is somewhat triangular, rounded anteriorly, with its posterior base elongated and free. It is situated in the anterior half of the body.

The second dorsal fin arises just anterior to the caudal fin. It is quadrangular, quite small, having its anterior margin slightly rounded, and its posterior extremity prolonged into a filament.

The pectorals arise at the base of the fourth branchial orifice, and are rounded anteriorly.

The ventrals, of a quadrangular form, commence just back of the middle of the body.

The anal fin commences on a line just in front of the second dorsal, resembling somewhat that fin in shape, but more deeply emarginated posteriorly.

The upper lobe of the caudal fin is very long, and curved at its extremity, its lower portion, a thin membrane, ends posteriorly in a small triangular expansion. The lower lobe is much smaller than the upper, and triangular.

Length, two to twelve feet.

*Remarks.* Although some slight discrepancies might be pointed out between our species and that described by Valenciennes, I have but little doubt that they are identical, and as such classify them. This species is exceedingly rare in our waters. In my "Report," published in 1839, I observed that "Dr. Yale had informed me that a species of *Zygæna* was found at Holmes Hole." In 'October, 1841, I had an opportunity to see a specimen which had been brought to this city by Winslow Lewis, Esq., from Chatham, Cape Cod, at which place it had been taken with a second specimen in a net. This individual I described in the second number of the fourth volume of the Boston Journal of Natural History, for September, 1842. In 1851, I received a specimen from Provincetown, from Mr. Jonathan E. Smith, taken accidentally in a net. Capt. Atwood also saw some half of a dozen of this species taken that season, one being seven feet in length. Previous to these, he had never seen but two or three, and those very small, in Massachusetts Bay. He had, however, seen them south of Cape Cod in some abundance. In September, 1857, I received a specimen from Capt. Atwood, taken at Provincetown, which is above described.

Massachusetts, STORER, New York, MITCHILL, DEKAY. Caribbean Sea, BANCROFT.  
"From Nantucket to Brazil," DEKAY. ;

## FAMILY XXIX. RAIDÆ.

Body very much flattened out, resembling a disk. Pectorals very large, uniting in front with the snout, and extending backward to near the base of the ventrals. Tail, more or less long and slender. Mouth, nostrils, and branchial openings, beneath. Eyes and temporal orifices, above. Dorsals (when present), almost always on the tail.

## GENUS I. RAIA. LIN.

Disk rhomboidal. Tail slender; with two small dorsals near the tip, and sometimes the vestige of a caudal fin. Teeth slender, close set, arranged in quincunx.

RAIA DIAPHANES, *Mitchill*.*The Clear-nosed Ray.*

(PLATE XXXIX. FIG. 1.)

*Raia diaphanes*, *Clear-nosed Ray*, MITCH., Trans. Lit. and Phil. Soc. N. Y. I. p. 478.

*Raia ocellata*, *The Ocellated Ray*, MITCH., STORER, Report, p. 191.

*Raia diaphanes*, *Clear-nosed Ray*, DEKAY, Rep. p. 366, pl. 77, fig. 215.

" " " LINSLEY, Cat. of Fishes of Connecticut.

" " " STORER, Synopsis, p. 510.

*Color.* The body above is of a light brown color, thickly sprinkled over its entire surface with more or less circular black spots or blotches, varying in their size from one half of a line to two lines in diameter; beneath, white. Pupils black, irides golden and stellated.

*Description.* In this species the pectorals are rounded; in front of them is a concavity on the sides of the head, which is preceded by a slight convexity of the margin. Snout obliquely projecting, blunted at extremity, with an emargination on each side. The length of the head is equal to about one-seventh the length of the body; its width across the pectorals more than half the length of the body; its width directly back of the eyes across occiput, as long again as the length of the head; the distance between the eyes is equal to one third the length of the head. The eyes are prominent, horizontally oval. The temporal orifices are situated obliquely, directly back of the eyes, and shorter than they. The length of the mouth is rather more than one third the length of the head. An aperture extends from the exterior angle of the mouth to the nostrils, which are situated directly in front of the mouth, large, and protected by fleshy elongations. The

branchial openings are situated at equal distances from each other. In front of, and at the sides of the mouth, and at the anterior portion of the pectoral fins, are seen a large number of minute black points which are mucous pores. The space between the anterior orbital ridge and the snout is naked and diaphanous. Minute sharp spines upon the snout, from which extend a series of spines on each side to the anterior orbital ridge; numerous exceedingly minute spines occupy the space between the eyes. From the anterior edge of the emargination on the sides of the snout, along the edge to the posterior portion of the head, are situated several rows of prominent recurved spines. Two rows of very prominent sharp spines, about a dozen in a row, are seen toward the outer portion of the pectoral fins. Two rows of spines on each side of the back of the tail; those at the posterior extremity are the largest, and between the two central rows is a naked groove. The remainder of the upper part of the surface of the body is destitute of spines. The anterior portion of the pectorals is reddish at the edge; posterior portion bordered with white rays very numerous and easily distinguished. The ventrals are quite large, containing about twenty-four rays; those next to the pectorals are very strong and lobed; these fins resemble very much the posterior wings of some of the *Phalænæ*.

Two subtriangular dorsal fins, of nearly equal size, and rough upon their surface, are situated a short distance in from the extremity of the tail; they are united to the tail by a delicate transparent membrane.

The tail is more than half the length of the entire fish, and is bordered by a membranous expansion upon its inferior edge.

The sexes are readily distinguishable by the ventral fins. From the ventrals in the male, extends a cylindrical appendage about half the length of the tail, measuring from the anal orifice, which is called the clasper; at its posterior outer portion it is fissured, and contains on its lower division a large falciform bony hook; and on the upper, a small projecting tooth, somewhat like a shark's tooth; the ventrals of the female are destitute of these appendages. Besides this sexual difference, in the female there are fewer spines upon the surface of the body generally, and particularly upon the fleshy portions of the pectorals. The male has fewer spots; his teeth are less prominent and less sharp than those of the female; the anal orifice of the male is circular, in the female it is a simple incision.

Length, two to three feet.

*Remarks.* This species, which grows to the length of three feet, is found along our whole coast; it is frequently taken while fishing for other species, and is found along the

beaches, swimming in shallow water. I have seen it at Provincetown, in great numbers, thrown upon the shores. It is so common at Nahant, that Mr. Jonathan Johnson, a fisherman of that place, informs me that it is not an unusual circumstance when a large number of hooks attached to the same line are baited, for a skate to be captured by each of them.

The specimen from which the above description and accompanying drawing were made, was taken with a hook from one of the bridges over Charles River.

I have never known them to be used as an article of food by our people, although Dekay says they are eaten in New York, by the poorer classes.

Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL, DEKAY.

RAIA LÆVIS. *Mitch.*

*The Smooth Skate.*

(PLATE XXXIX. FIG. 2.)

*Raia lævis*, *Smooth-backed Skate*, MITCH., Amer. Month. May 11, p. 327.

“ *batis*, *Skate*, STORER, Report, p. 193.

“ *lævis*, *Smooth Skate*, DEKAY, Report, p. 370.

“ *batis*, *Skate*, LINSLEY, Cat. of Fishes of Connecticut.

“ *lævis*, STORER, Synopsis, p. 511.

*Color.* Above, of a light ash color, with a few indistinct symmetrically arranged yellowish ocelli; one in front of, and exterior to each eye; two posterior and exterior to each eye; two at the posterior base of each pectoral fin, and one on each ventral fin. All the under portion of the body is of a dingy white color. Pupils black; irides silvery, with a beautiful golden fringed curtain suspended from above.

*Description.* Rhomboidal. The entire length of the head is nearly equal to one fourth the length of the fish; the head is much compressed, with a furrow between the eyes, which extends to the posterior portion of the snout. Snout slightly blunted. The eyes are oblong and moderate in size. The distance between the eyes is less than one fourth the length of the head. The gape of the mouth is large. The jaws are composed of compact, hexædral teeth, forming almost a plane surface, the inner angle of the innermost middle ones, beginning to become acute. The nostrils are a short distance in front of the mouth. Branchial apertures situated obliquely, the anterior the longest. The greater part of the body is smooth above. A strong spine, naked at its tip, is situated at the anterior angle of each eye, and a smaller one exists at the posterior angle; back of the latter, is a strong spine at the posterior inner edge of the temporal orifices. A series of very minute spines along the inner edge of the orbit. The top of the snout is

covered with small, sharp, flexible spines; their extremities are naked; similar spines are continued along the edge of the head to the base of the pectoral fins; upon the anterior edge of the pectorals are numerous very minute spinules. On the upper portion of the pectorals, toward the lateral angle, are four or five longitudinal rows of very sharp, incurved, erectile spines, — some of the rows containing a dozen or more spines. A few short spines are distributed upon the posterior inferior base of the pectorals, — and some very minute asperities may be felt upon the ventrals. A row of prominent strong spines, — ten, twelve, or more in number, — commence just back of the eyes, and extend along the dorsum to the first dorsal fin. In the intervals between these, are numerous minute spinules; on each side of the central row is a perfectly regular series of small spines extending from the shoulder to the first dorsal fin. Two spines are situated upon each shoulder, — the posterior of which is the longer. On each side of the dorsum, passing from the shoulders to the posterior portion of the body, and also exterior to each shoulder, are seen lines resembling the lateral line, passing down to, and bifurcating upon the pectorals, from which, small mucous ducts are distributed at regular intervals. Body beneath perfectly smooth, with the exception of a very few spines scarcely perceptible, unless by the touch, on each side of the commencement of the caudal fin, and a small patch of equally minute spinules upon the middle of the tail, just in front of the termination of the ventral fins. Mucous pores are scattered over the greater portion of the under surface, appearing like black dots, in most instances distributed in a regular manner, although a longitudinal line of these is seen toward the middle of the pectorals, and another transverse one at the base of the ventrals.

The dorsal fins are of equal length; the first, a little the higher and connected at its base to the tail by a membranous prolongation; both dorsals rounded above. These fins are separated from each other by a short interval. The posterior terminates near the extremity of the tail.

Length, two to five feet.

*Remarks.* This species is common in Massachusetts Bay.

Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL.

#### GENUS II. PASTINACA. Cuv.

Tail slender, without fins; but armed with one or more long spines, which are dentated on the edges.



PASTINACA HASTATA, *Dekay*.*The Whip Sting-Ray.*

(PLATE XXXIX. FIG. 3.)

*Raia centroura*, *Prickly-tailed Sting-ray*, MITCHILL, Trans. Lit. and Phil. Soc. N. Y. i. p. 479.*Pastinaca hastata*, *Whip Sting-ray*, DEKAY, Report, p. 373. p. 65, fig. 214.*Trygon centroura*, " " " LINSLEY, Cat. of Fishes of Connecticut." *hastata*, DEKAY, STORER, Synopsis, p. 261.

*Color.* Body, pectorals, and ventrals, light brown above, whitish beneath; tail, dark brown throughout.

*Description.* Body ovoid, its lateral margins blending imperceptibly with the pectorals, which, continued anteriorly, form with the snout an almost unbroken curve. Greatest width of body, about equal to its length exclusive of the tail, and about five times the greatest depth.

Eyes oval, of moderate size, situated obliquely, the greatest divergence posteriorly; distance between them being about three quarters that to tip of snout. The temporal orifices are large, just behind the eyes, the anterior edge coming to a line with their middle point; situated obliquely, in opposite direction to that of the eyes. Nostrils small, their alæ, large and projecting. Mouth moderate, transverse, curved anteriorly; teeth sessile and smooth.

Surface of body without spines or projections, save a single row of large, irregular, horny tubercles posteriorly. These commence on the median line of the back, at its last quarter, and extend upon the tail. This organ, which is studded throughout with similar projections, is long, flexible and tapering. At the end of its anterior fourth there arise in succession, a pair of strong, elongated and pointed spines, flattened above and beneath and serrated upon their lateral edges. These spines are each received into a smooth longitudinal groove when at rest. Their number undoubtedly varies. Dekay speaks of three being present, — and in the specimen from which his description is drawn, but one is present, although the stump of a second, the anterior one and its distinctive groove, afford evidence of its former existence.

Anus longitudinal, near the origin of the tail.

The greatest depth of pectorals on a line with the temporal orifices.

The ventrals are fan-shaped, emarginated posteriorly. The claspers are rather more than one half the length of the ventrals.

Length of specimen here described, a male, from the snout to the commencement of the tail three feet and a half; from the snout to the end of the tail, nine feet.

Length, five to nine feet.

*Remarks.* Previous to the publication of my "Report on the Fishes of Massachusetts," I was aware that a species of sting-ray inhabited our waters. Thus, Dr. Yale, then of Holmes Hole, wrote me: "I have seen frequently in this harbor and have assisted in taking them; but, owing to their poisonous nature when wounded by their sting, we have been rather cautious about taking them into the boats, so that we seldom see one on shore. One or two individuals in this vicinity have come well nigh losing their lives by a wound from them. In July and August they are abundant on the flats in the harbor here." When captured they are taken by the harpoon. In October, 1840, I received from Dr. Yale the head and tail of a species, which I supposed to be Mitchill's *Raia centroura*,—and afterwards another tail of this species was sent me from Holmes Hole. In September, 1857, my friend E. W. Carpenter, M. D., of Chatham, Cape Cod, sent me the fine specimen from that place which has enabled me to present the above description and accompanying figure.

Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL.

### GENUS III. MYLIOBATIS. DUM.

Head projecting from the pectorals, and the latter more broad transversely than in the other Rays, which gives them somewhat the appearance of a bird of prey with the wings extended, and has caused them to be compared to the eagle. Their jaws are furnished with broad, flat teeth, arranged like the squares of a pavement, and of different proportions, according to the species; their tail, extremely long, is terminated in a point, and is armed like that of a trygon, with a strong spine, serrated on both sides, and has above, toward its base, in front of the spine, a small dorsal. Sometimes there are two or more spines.

MYLIOBATIS ACUTA, *Ayres.*

*The Smooth-tailed Sting-Ray.*

(PLATE XXXIX. FIG. 4.)

*Myliobatis bispinosus*, STORER, Proceed. Bost. Soc. Nat. Hist.

" " " Bost. Journ. Nat. Hist. iv. p. 187.

" " " AYRES, Bost. Journ. Nat. Hist. iv. p. 290, pl. 13, fig. 1.

*Myliobatis acuta*, LINSLEY, Cat. of Fishes of Connecticut, SILLIMAN, Journ.

" " STORER, Synopsis.

*Color.* The whole body and head above, reddish brown; tail lighter at the base, but nearly black toward the tip; beneath, whitish.

*Description.* Body above, smooth, entirely destitute of spines, even on the dorsal ridge. Entire length, three feet eleven inches; length, exclusive of the tail, one foot six inches; breadth across the pectorals, two feet five inches. Distance between the eyes, four and a quarter inches; eyes vertical, elliptical, greatest diameter one inch, least diameter three quarters of an inch. On the summit of the orbit of each eye is a hard, blunt, vertical projection, about one eighth of an inch in height, nearly white at the extremity. The head is rounded anteriorly, and extends backward, widening but little, four and a half inches, until opposite the eyes, where it joins the body. Mouth two inches in breadth, situated four inches posterior to the snout; jaws lined with numerous blunt, tessellated teeth. Nostrils about an inch and a half anterior to the mouth, each provided with a valve, and having a depression or channel leading back almost to the corner of the mouth. Branchial apertures five on each side; distance between the anterior pair, four inches. Spiracles situated behind the eyes, elliptical, one and a half inches in length.

On the tail are two reversely serrated spines, one situated directly above the other, of which the upper is the shorter; their lengths are two and three fourths and three and three fourths inches. Their insertion is at about five and a half inches from the origin of the tail; in color they are dingy white. Immediately before them is a small dorsal fin, one and a half inches in length, and one inch in height. Tail very slender, smooth to the tip, the inferior surface presenting no vestige whatever of fins. Anus beneath the origin of the tail; immediately posterior to it are two cylindrical, or slightly conic appendages, three and three fourth inches in length. As the specimen here described is the only one which has fallen under my notice, I am of course unable to determine whether all the characters which have been stated will prove to be constant. With respect to one, the relative length of the two spines upon the tail, variation may probably be expected. The upper spine will, in some instances, doubtless be the longer of the two. The specimen figured was apparently a male.

Length, three to four feet.

*Remarks.* In December, 1841, I presented to the Boston Natural History Society, the tail and portion of the jaw of a species of myliobatis which I had just received from Dr. Yale of Holmes Hole, — and from two spines which were situated upon the tail, I proposed the specific name of bispinosus. Mr. William O. Ayres, then of Hartford, Connecticut, afterwards found an entire specimen at Brookhaven, Long Island, and called it myliobatis acuta; this name, however, he withheld, and in his description of this species, prefixed the name I had indicated, — at the same time remarking, “It is a very clearly marked species, and as Dr. Storer was obliged to draw up his account from imperfect

materials, I have prepared a description and drawing." Yarrell in his generic characters of the genus *myliobatis*, which I had examined, speaks only of "a serrated spine" upon the tail; whereas, Dumeril, in his formation of the genus, says, "sometimes there are two or more spines." My specific name, heretofore, was evidently untenable,—and as Ayres published the first accurate description, his name *myliobatis acuta* should undoubtedly be acknowledged. I have never seen a perfect specimen, and have therefore given Ayres' description and figure.

Massachusetts, STORER. Connecticut, AYRES.

#### GENUS IV. TORPEDO. DUM.

The disk of the body nearly circular; pectoral fins large; two dorsal fins placed so far back as to be on the tail; surface of the body smooth; tail short and rather thick; teeth small and sharp.

*TORPEDO OCCIDENTALIS*, Storer.

*The Cramp-Fish.*

(PLATE XXXIX. FIG. 5.)

*Torpedo occidentalis*, STORER, Amer. Journ. of Arts and Sciences, 45, p. 165, pl. 3.  
 " " " Synopsis, p. 516.

*Color.* The whole upper surface of this species is of a dark brown, with a few almost black spots distributed over it; beneath, white.

*Description.* The entire length of the specimen before me, which is a female, is four feet and two inches, and its greatest breadth is three feet. The globe of the eye, which is circular, is an inch and a quarter in diameter; the cornea is oval; its longest diameter is one half of an inch, and is directed obliquely outward; its shortest diameter is three eighths of an inch.

The spiracles are oval and smooth at their edge; they are one and a quarter inches in their largest diameter, and one inch in their shortest diameter, and are directed outward and a little forward. On the anterior and inner surface of the spiracles, just within the orifice, is a plaited membrane, the folds of which resemble somewhat the nasal septa; the longest of these folds are next to the median line, and they gradually diminish in length as they recede from it. The mouth, when closed, measures six inches across from the angles, and when opened to its widest extent, measures from the middle of the upper to the middle of the lower jaw, five inches. The teeth are numerous, small, and sharp,—broad at their bases, and pointed at their extremities, like spines.

When the fish is placed upon its under side, and the anterior extremity of the disk is turned backward, the nostrils are observed about three inches beneath its edge; they are covered above by a membranous prolongation, formed by a fold of the skin which arises from their exterior angle and is continued to the median line; the free edge of this fold is five eighths of an inch wide at its greatest width. A second fold commences at their outer upper angle, and passes downward and inward to the middle of the lower edge of the aperture. A third fold commences near the middle of the second, and is directed outward and a little downward. The nasal cavity is divided by a horizontal plate into two portions, and at right angles to this proceed numerous small septa going to the upper and lower margin of the nostrils.

The first dorsal fin, which is three inches and a quarter long and five inches high, is situated at the posterior portion of the pectorals, one half of its base being posterior to those fins.

The second dorsal fin is two inches long, and two inches and three quarters high; it is two and a half inches back of the first dorsal, and three inches anterior to the commencement of the upper lobe of the caudal fin.

The greatest length of the pectorals is two feet, and their greatest breadth is fifteen inches.

The ventrals are ten inches long, and five and a half wide. The anus is large, and is situated beneath the middle of the ventrals.

The caudal fin is nearly triangular; its lower portion is the larger; the depth of this fin, at its posterior extremity when expanded, is eleven inches; its posterior margin is straight.

Length, two to five feet.

*Remarks.* In the January number of the "American Journal of Science and Arts" for 1843, I made a slight reference to a species of torpedo, which had been taken a few weeks previously upon the coast of Massachusetts. The description of a species captured on the coast of Ireland, published by William Thompson, Esq., Vice President of the Belfast Natural History Society, in the "Annals of Natural History," answered so well to my specimen, that I was led to suppose it must be the *nobiliana*, Buanaparte. When, however, I carefully compared with mine, the description and figure of the foreign species, contained in the second edition of Yarrell's British Fishes, I found no slight differences in the form of the disk of the body, in the size of the pectoral and caudal fins, and in the situation and form of the temporal orifices in the two specimens; and at once suspected the American fish must be an undescribed species. As Yarrell's figure was en-

graved from a dried specimen, and consequently might not perfectly represent the form of this fish, I wrote to Mr. Yarrell, stating to him my doubts of the identity of the two fishes, and presenting him with my figure. His opinion coincided perfectly with mine. I have, therefore, the pleasure to present a description of a torpedo hitherto unknown to science; and as no other species of this genus is known to exist on the shores of our hemisphere, I shall call it *Torpedo occidentalis*." The above remarks, I have copied from my communication upon this subject, in the October number of the American Journal of Science and Arts, for 1843. A portion of the following observations also will be noticed to have been transferred from the same paper.

Dr. Mitchill introduced the *Raia torpedo* into his "Fishes of New York," published in 1815, upon the authority of several fishermen with whom he had conversed, who had been electrified by a species of ray, when they were detaching it from the hook with which it was taken. He had never seen a specimen, but had no doubt of its being the common torpedo, and consequently catalogued it as such. Since the appearance of Dr. Mitchill's paper, I can find no further notice of the existence of an electrical ray in our waters. In my "Report on the Ichthyology of Massachusetts," published in 1839, I cited the testimony of several observers to prove that an electrical fish, known as the *cramp-fish*, was occasionally taken on the shore of Cape Cod, but had never been seen by a naturalist. During the month of November, 1842, a specimen of this long-looked-for species was captured at Wellfleet by Mr. Seth N. Covell; I fortunately obtained it, and from it prepared the above description. In Massachusetts Bay, this species appears to have been met with only on the eastern shore of Cape Cod, between Provincetown harbor and Orleans, an extent of about thirty miles; and is found in greater numbers upon the eastern shore of Long Point, a narrow neck of land west of the town of Provincetown, than at any other place. In these localities, it is observed only in the months of September, October, and November. The greater number of those taken run ashore upon the sandy beaches. Captain Atwood informs me he has known three individuals to be taken with the hook, by persons fishing for other species; and that others, being discovered in the day-time near the shore, are harpooned and dragged on shore. In the year 1819, and for four or five years afterwards, this species was unusually common at Provincetown — from sixty to eighty being seen in a year; since that time they have been comparatively scarce, and for the ten years preceding 1845, not more than thirty were found; in that year, 1845, a dozen were noticed. While on a visit at Gay Head, in August, 1846, I was informed by Captain Leonard West, of Chilmark, and Mr. Samuel Flanders, keeper of the light-house of Gay Head, that in Chilmark, three miles from Gay Head, they had known

at least fifteen or twenty of this species to be taken by hook and line, and also in seines, for several years in succession, in the spring of the year. Although I had supposed it was a southern species, this was the first positive information I had received of its being taken south of Cape Cod. During the latter part of October, 1845, Captain Atwood brought from Provincetown to Boston a living specimen, weighing about sixty pounds. It was found near the shore apparently benumbed, and was readily dragged ashore by attaching a rope to its tail. In company with my friend, J. B. S. Jackson, M. D., I visited it while it was still alive in the well of the smack in which it had been brought. Upon its being lifted upon the wet deck, it gave a distinct shock. This shock was scarcely perceptible while the fish was quiet, and was most marked when the portion directly over the electrical organs was excited. The most powerful effect was produced by seizing the tail with one hand, and grasping that portion of the pectoral fins which is supplied with nerves from the fifth pair; here, quite a shock was perceived in the arms as high as the elbows. In some cases, the shock produced by this fish, when in the water, is irresistible. The following anecdote I copy from my Report: "Mr. Newcomb, senior, the oldest fisherman in Boston market, stated to me, that his father, who resided at Wellfleet, had a dog which frequently waded into the shallow water of the coves and brought out flounders which he had seized with his mouth. In one of his fishing excursions he attacked a torpedo, which perfectly convulsed him; he dropped the fish, and ran away howling most piteously, and could never be persuaded to resume his fishing." Captain Atwood informs me that he has received a great many very powerful shocks which have thrown him upon the ground as quick as if he had been knocked down with an axe. He has also received many shocks by taking hold of the pole of an harpoon, when he was at the distance of eight or ten feet from the fish; and he has also felt its effects when holding the rope attached to the harpoon; but in this, and in removing the liver from the fish when it is nearly dead, there is generally nothing more than a numbness felt in the fingers, and they seem inclined to straighten; so that he has known it to be difficult to grasp the handle of the knife while cutting the fish.

The smallest individuals do not exceed twenty pounds in weight, while Capt. A. thinks the largest may weigh from one hundred and seventy to two hundred pounds. The largest circumference of any of them, is about twelve feet. They are taken for their oil. The livers of the largest specimens yield about three gallons of oil; those of the smallest ones, a pint; the ordinary sized livers furnish from one to two gallons. Many of the fishermen have an opinion that this oil is serviceable in cases of cramp when exteriorly applied, and relieves cramp in the stomach when internally administered.

But it is principally valued as lamp-oil; for this purpose it is superior to the oil obtained from any other fish, and is equal to purified sperm oil.

Massachusetts, STORER.

### ORDER III. CYCLOSTOMI.

Gills purse-shaped, fixed, opening outwards by several apertures. Jaws represented by an immovable cartilaginous ring, formed by the union of the palatine and mandibular bones. Intestinal canal straight and narrow.

### FAMILY XXX. PETROMYZONIDÆ.

Body elongated, cylindrical, eel-shaped. No pectorals nor ventrals. Fins without rays.

#### GENUS I. PETROMYZON. LIN.

Seven branchial apertures on each side of the neck. Maxillary ring armed with strong teeth. Mouth beneath.

#### PETROMYZON AMERICANUS. *Lesueur.*

#### *The Great Lamprey.*

(PLATE XXXVIII. FIG. 4.)

*Petromyzon marinus*, *Great Lamprey*, MITCH., Trans. Lit. and Phil. Soc. N. Y. i. p. 461.

*Petromyzon americanus*, LESUEUR, Trans. Amer. Phil. Soc., new series, i. p. 382.

" " *American lamprey*, STORER, Report, p. 195.

" " *American sea lamprey*, DEKAY, Report, p. 379, pl. 66, fig. 216.

" " STORER, Synopsis, p. 265.

*Color.* Above, olive-brown, mottled with dark brown, almost black, confluent patches; beneath, of a uniform dull brown. Pupils black, irides golden.

*Description.* The anterior portion of the body is cylindrical; the posterior compressed. A slight carina is observed upon the back. Head rounded, somewhat flattened on the upper portion in front of the eyes. Snout obtuse. Eyes of moderate size. The distance of the eyes from the snout is less than one twelfth the length of the entire fish. A tubular orifice, a line in its longest diameter, is seen in front of, between the eyes. Posterior to each eye, are seven large branchial apertures, separated about a quarter of



an inch from each other, passing backward in nearly a straight line. When unattached the mouth of this fish is a longitudinal fissure; when attached it is circular, the lip forming a ring, within which are situated numerous hard, horny teeth of a yellow color. The anterior and the inner row of the lateral teeth are the larger; the posterior teeth are more numerous, and smaller. Mucous pores are seen upon the upper portion of the head.

The first dorsal fin arises posterior to the middle of the body; its height is less than one sixth its length.

The second dorsal fin is situated about an inch posterior to the first dorsal; its greatest height is equal to about one sixth its length. This fin is continued to, and united with, the caudal fin.

The anal fin is a mere fringe.

The caudal fin seems, like the extremity of the solid portion of the body, very much compressed, or is an expansion of the dorsal and anal fins.

Length, two to three feet.

*Remarks.* This species is occasionally taken in Massachusetts Bay attached to pieces of drift-wood and the bottoms of boats and larger vessels. In its spawning season, it ascends the mouths of rivers. In the Merrimac River, at Lowell, it is taken in large quantities. I am indebted to the late Elisha Bartlett, M. D., for the following interesting facts. He wrote me, that "they ascend the rivers a little earlier than the shad, and move mostly in the night. It is not known by the fishermen when they return, as they are never seen. There is a notion that they all die. They are often seen in the Summer in pairs at work together, constructing a little mound of stones. They build this about three feet in diameter at the base, and about two feet high, of stones from the size of an ounce bullet to that of the fish. They often aid each other in carrying the same stone. This is pretty evidently a *labor of love*, as they copulate once in five minutes, or so, during the whole time. The young go down the river when the water begins to freeze. They are from six to eight inches long."

Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL, DEKAY.

PETROMYZON NIGRICANS. *Lesueur.**The Bluish Lamprey.*

(PLATE XXXIX. FIG. 6. a. Mouth.)

- Petromyzon nigricans*, LESUEUR, Trans. Amer. Phil. Soc., new series, vol. i. p. 385.  
 " " *The bluish lamprey*, STORER, Report, p. 197.  
 " " *The bluish sea lamprey*, DEKAY, Report, p. 381, pl. 79, fig. 247.  
 " " " " " " LINSLEY, Cat. of Fishes of Connecticut.  
 " " " " " " STORER, Synopsis, p. 517, 265.

*Color.* The upper part of the body is of a deep bluish green color ; beneath, bluish white. Pupils black ; irides silvery. On the top of the head, between the eyes, a small white spot exists.

*Description.* The body is cylindrical anteriorly, compressed posteriorly, very much so at the tail, which terminates in a point. The head is oval, flattened on the top ; the length of the head, measured from the snout to the posterior angle of the eye, is less than one eighth the entire length of the fish. The branchial orifices, of equal size, are situated obliquely back of the eyes. The eyes are of moderate size. The mouth is circular ; its diameter is equal to two thirds the length of the head and surrounded by a fleshy margin ; it is armed within by numerous incurved teeth or horny spines, projecting from widened bases resembling the spines with which the *Raïæ* are armed ; these are much larger on the anterior portion of the disk, and quite small upon the posterior portion.

There are three teeth in the throat ; two higher up than the third, which is in front of and between the others. Posterior to these, is a semicircular bony ridge similar to the jaws of the *Orthogoriscus*.

The first dorsal fin is situated on the posterior half of the fish ; it is rounded posteriorly. The distance between the dorsals is equal to half the length of the first dorsal. The anterior portion of the second dorsal fin is considerably higher than the first dorsal. This fin is as long again as the first dorsal ; it gradually diminishes in height toward the caudal fin, to which it is attached, and forms with it a continuous fin.

The caudal fin is a simple membrane, triangular at its termination, and uniting with the anal fin which is very small.

Length, three to seven inches.

*Remarks.* This species is found attached to other species of fishes. It is not unfrequently affixed to mackerel ; less often to cod ; and still less frequently to haddock.

Massachusetts, LESUEUR, STORER. Connecticut, LINSLEY.

AFTER this memoir on the Fishes of Massachusetts was completed, aware that several species had been described during its preparation, which I had not included in my communication, I requested Mr. Frederick W. Putnam, Curator of Ichthyology in the Boston Society of Natural History, and also in the Essex Institute, to furnish me with a list of these. He has placed me under great obligations by sending me the accompanying catalogue.

1. *Grystes fasciatus*, Ag. (Black Bass of the Lakes.)

This species, which is the common lake bass and black bass of the Great Lakes, Lake Champlain, and several lakes in New York, and which also extends farther south, has been introduced into Great Sandy Lake, in Wareham. In the Summer of 1862, a specimen of this fish was caught in Massachusetts Bay, by one of the members of the state legislature, and is now in the state cabinet. The fish had evidently found the salt water not much to its liking, as it was much emaciated, and had changed so in its general appearance as at first sight hardly to be recognized.

2. *Priacanthus altus*, GILL, Proc'd. Philad. Ac. Nat. Sci., 1863, p. 332.

A specimen of this most beautiful little fish was found alive on Marblehead Beach by Miss Mary Nichols, of Salem, and is now in the Essex Institute. Only three other specimens are known of this species.

3. *Bryttus obesus*, GIRARD, Proc'd. Philad. Ac. Nat. Sci. Syn. *Pomotis obesus*, GIR., Proc'd. B. S. N. H.

Girard's specimens were from Framingham. I have found it quite common in several ponds in Essex County, and also in Fresh Pond (Cambridge), and in a pond in Malden. It is probably a widely distributed species, and may prove to have been described by some of the earlier authors. (See Gill in Proc'd. Philad. Ac.)

4. *Cryptacanthodes inornatus*, GILL, Proc'd. Philad. Ac. Nat. Sci., 1863, p. 332.

Have seen a specimen of this pure white *Cryptacanthodes* taken off Swampscott.

5. *Gasterosteus Wheatlandi*, PUTN., Proc'd. E. I., v. p. 4, 1866.

Specimens of this species were taken at Nahant, on April 15, 1859, by the late Dr. R. H. Wheatland. The species is very strongly characterized.

6. *Zeus ocellatus*, STORER. *Zenopris ocellatus*, GILL, *Proc. Philad. Ac.*, VI. p. 888.

7. *Trachynotus Corolinus*, GILL.

8. *Trachynotus ovatus*, GUNTHER.

These two species were collected at Wood's Hole by Prof. Baird. See Gill, *Proc. Philad. Ac.*, 1863, p. 332.

9. *Blennius*. (*sp.* ?)

A specimen of Blenny, of a species unknown to me, was found on a barnacle taken from a ship in Salem, just arrived from Africa. The specimen is in the Essex Institute.

10. *Cyprinodon variegatus*, LA CEP.

I have seen specimens taken in several localities on Cape Cod. Gill (*Proc. Phil. Ac.* 1863, p. 332) mentions that Prof. Baird found species at Wood's Hole; and Lyman (*Proc. B. S. N. H.* VII. p. 76) states that he found it at Yarmouth; (Lyman gives it under the name of *C. ovinus*.)

11. *Centriscus scolopax*, STORER, *Proc. B. S. N. H.* v. p. 178.

12. *Salmo eryox*.

Prof Agassiz, in *Proc. B. S. N. H.*, states that a specimen of this European trout or salmon was captured at the mouth of the Merrimac River. The *S. eriox* of Europe (Parnell and Kroger) is referred by Dr. Gunther to *S. trutta*.

13. *Salmo*. (*sp.* ?)

I have seen specimens of a small headed trout, similar to the "Blue back" of the Richardson Lakes, taken in the western part of the state; but have no specimens, and do not know the exact locality. The specimens were not *S. fontinalis*.

14. *Ciliata argentata*, GILL, *Proc. Philad. Ac. Nat. Sci.*, 1863, pp. 241 and 332.

During one tide in the Summer of 1860, Mr. Caleb Cooke, of Salem, found a large number of specimens of this species, on Nahant Beach; and in 1861, I found three specimens in the surf at West's Beach, Beverly. Gill also mentions it from Nahant. (Col. by Dr. Slack.)

15. *Euchalarodus Putnami*, GILL, *Proc. Philad. Ac. Nat. Sci.*, 1864, p. 216, and p. 221.

This species is described by Prof. Gill, from two specimens belonging to the Essex

Institute, which were taken off Beverly Bridge, in Jan., 1858, by my brother, C. A. Putnam.

16. *Liparis*, (*sp.?*) allied to *L. arctica*.

Several years ago, living specimens of this species were in Mr. Cutting's Aquarial Gardens, and were dredged in the bay. Afterwards I obtained two specimens from Mr. Fuller, of Portland, who collected them in Portland harbor. (These specimens are now in the M. C. Z. at Cambridge.) There is also a specimen in the state cabinet, collected at Nahant, by Charles Flint, Esq., and Mr. Alex. Agassiz has also collected specimens at Nahant, which are in the Museum at Cambridge.

17. *Leptocephalus gracilis*, STORER.

Mr. Caleb Cooke, of Salem, found four specimens of this species on Nahant Beach, in the Summer of 1860. These specimens are now in the Essex Institute, Boston Soc. Nat. Hist., and Museum of Comp. Zoölogy.

18. *Ammodytes dubius*, REINH.

Dr. Gunther (Cat. Fish, iv. p. 387) states that there is a specimen of this species, in the British Museum, which was taken in Boston. I much doubt the species being found so far south, though I have seen large specimens of *A. americanus*, that might be easily mistaken for *A. dubius*, from our bay.

19. *Syngnathus*, (*sp.?*)

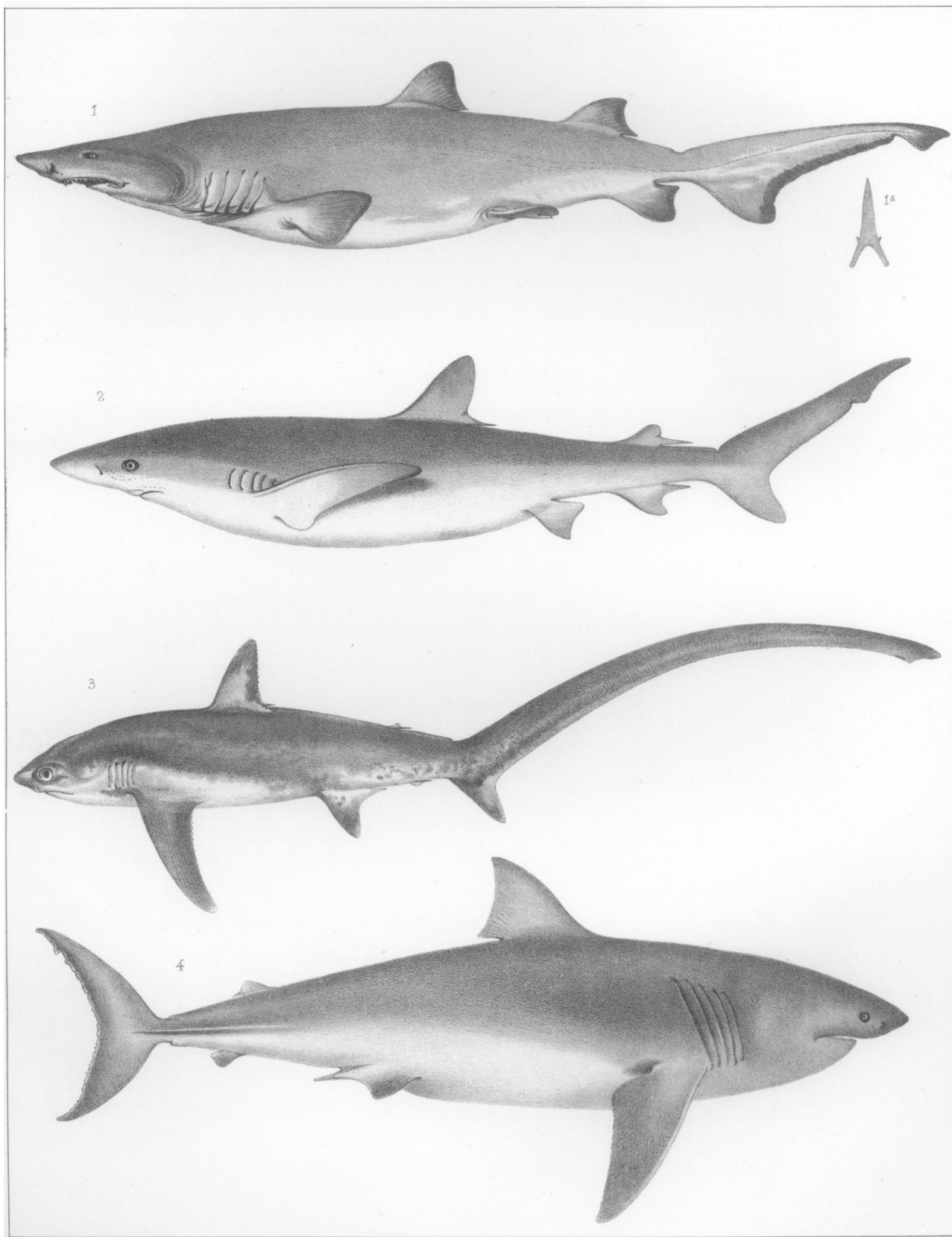
I have seen three or four specimens of a *Syngnathus* from Cape Cod, which were three or four times the size of *S. peckianus*, and different in other respects from that species. (Specimens in the Essex Institute, and Museum of Comp. Zoölogy.)

20. *Hololepis fusiformis*, PUTN., Bul. Mus. Comp. Zoöl., 1863. Syn. *Boleosoma fusiforme*, GIR.

Girard's specimens were from Framingham. I have found it very plenty in several ponds in Essex County, and also in other parts of the state.

21. *Semotilus corporalis*, ABBOTT, Proc'd. Philad. Ac. Nat. Sci., 1861, p. 154.

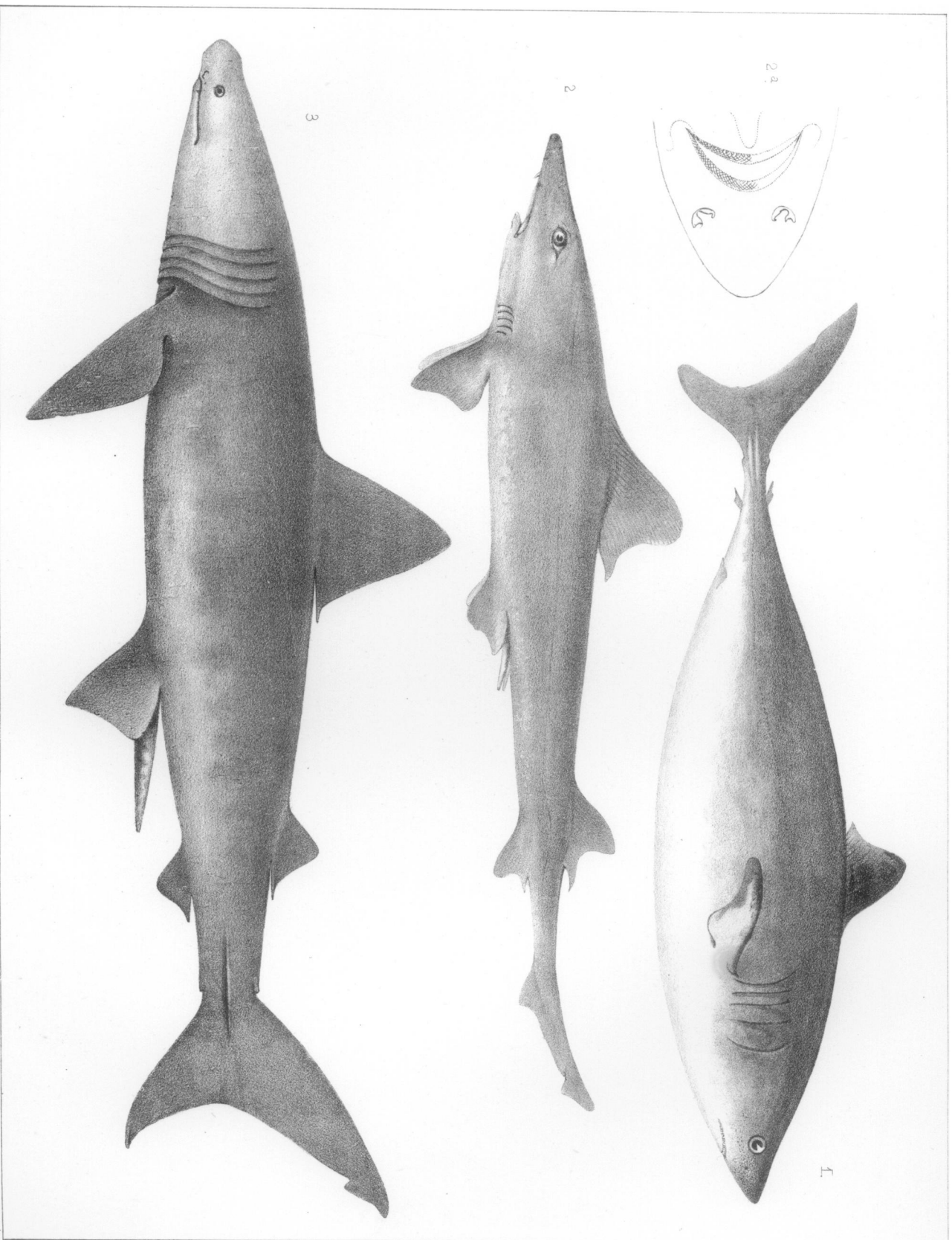
Have collected specimens of this fish in the brooks near Williams College.



J.R. Burford Lith. Boston.

1. *Carcharias griseus*. Ayres.  
1a. tooth.

2. *Carcharias obscurus*. Lesueur.  
3. *Carcharias vulpes*. Cuv.  
4. *Carcharias Atwoodi*. Storer.



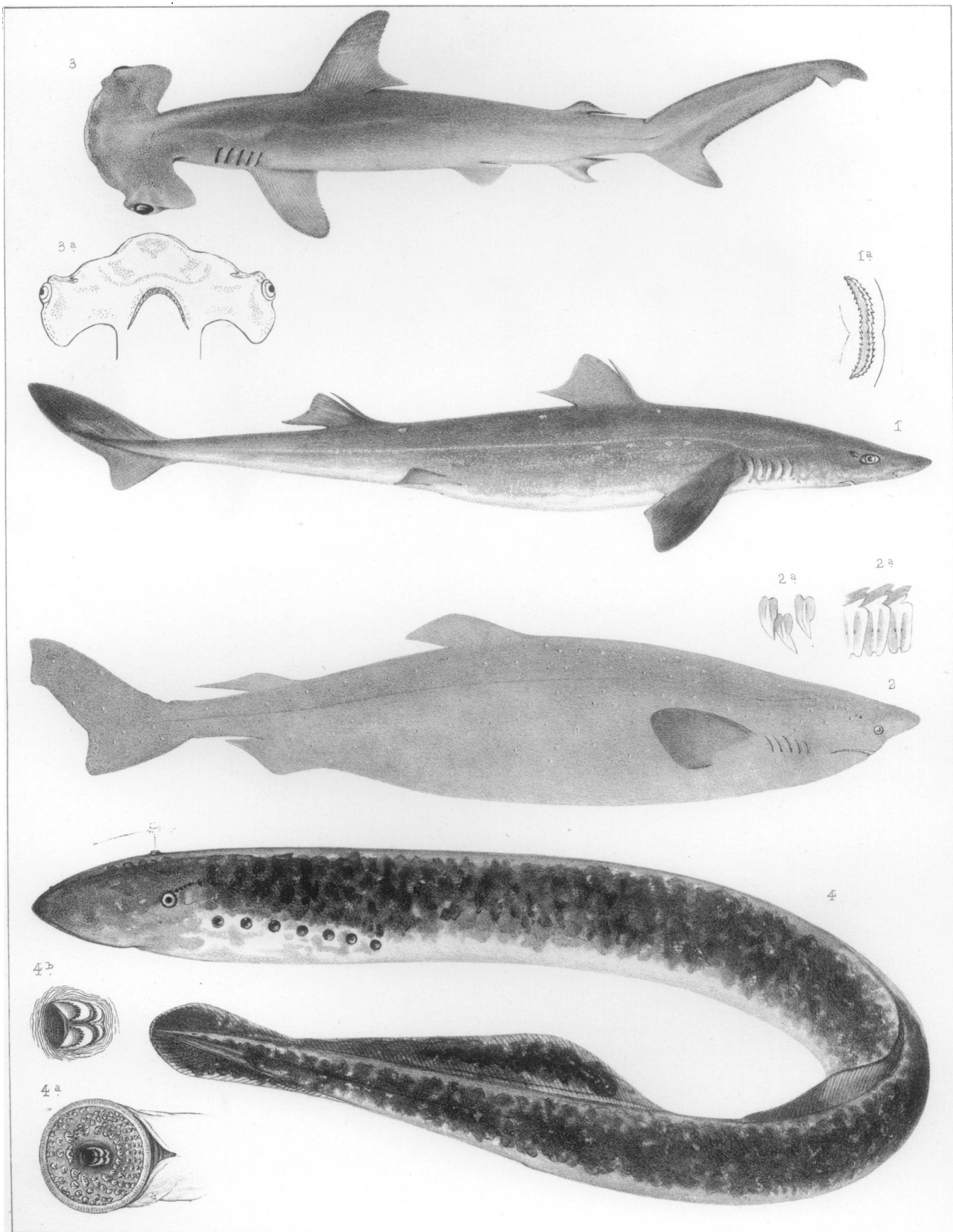
J. H. Bufford & Lith. Boston.

1. *Lamna punctata*. *Storer*.

2. *Mustelus canis*. *DeKay*.

3. *Selachius maximus*. *Cuv.*

2 a. head, beneath.



J.H. Bufford's Lith. Boston.

1 *Acanthias Americanus*. *Storer*.

1<sup>a</sup> teeth.

2 *Scymnus brevipinna*. *Dekay*.

2<sup>a</sup> teeth in both jaws.

3 *Zygaena malleus*. *Val.*

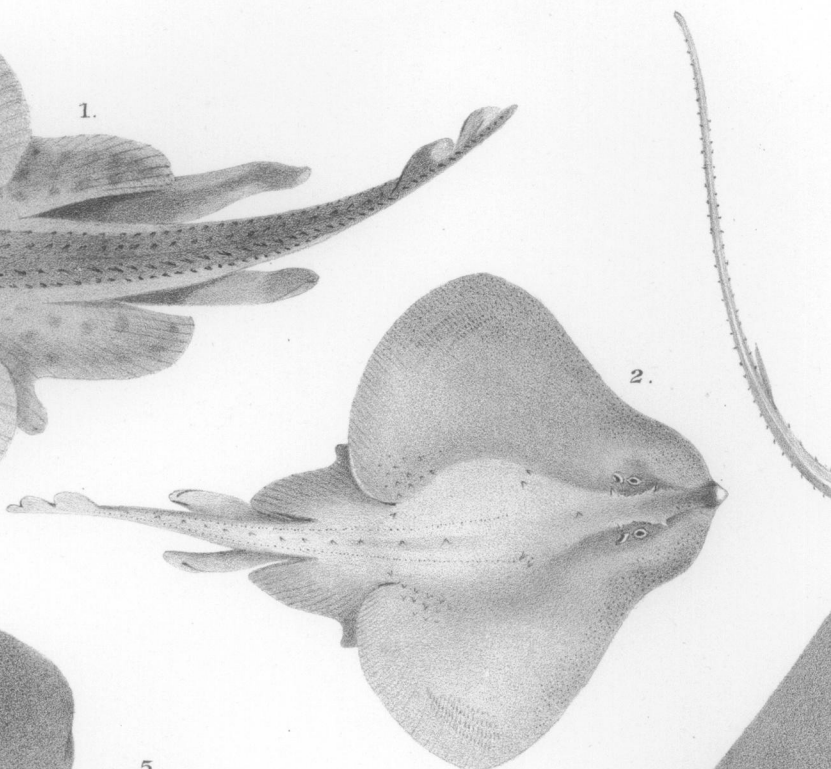
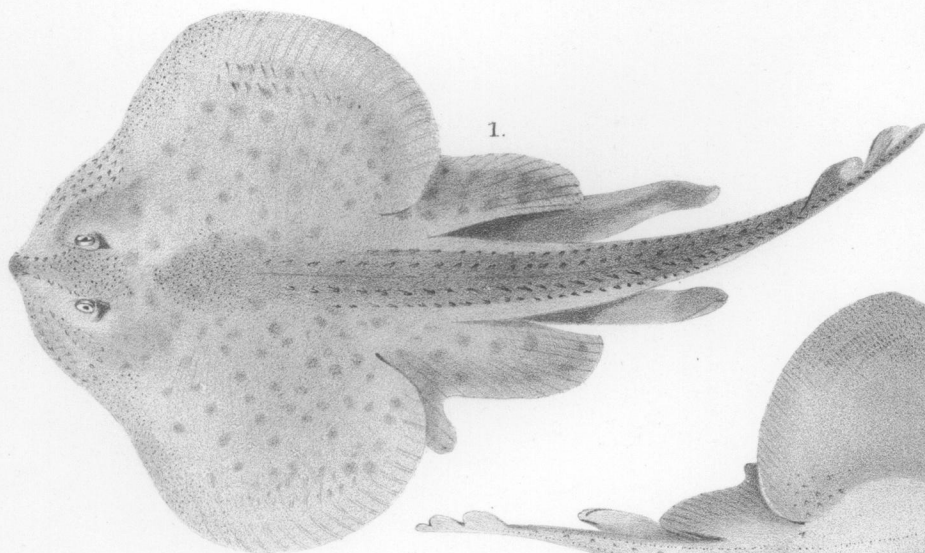
3<sup>a</sup> head, beneath.

4. *Petromyzon Americanus*. *Lesueur*

4<sup>a</sup> mouth. 4<sup>b</sup> central teeth.

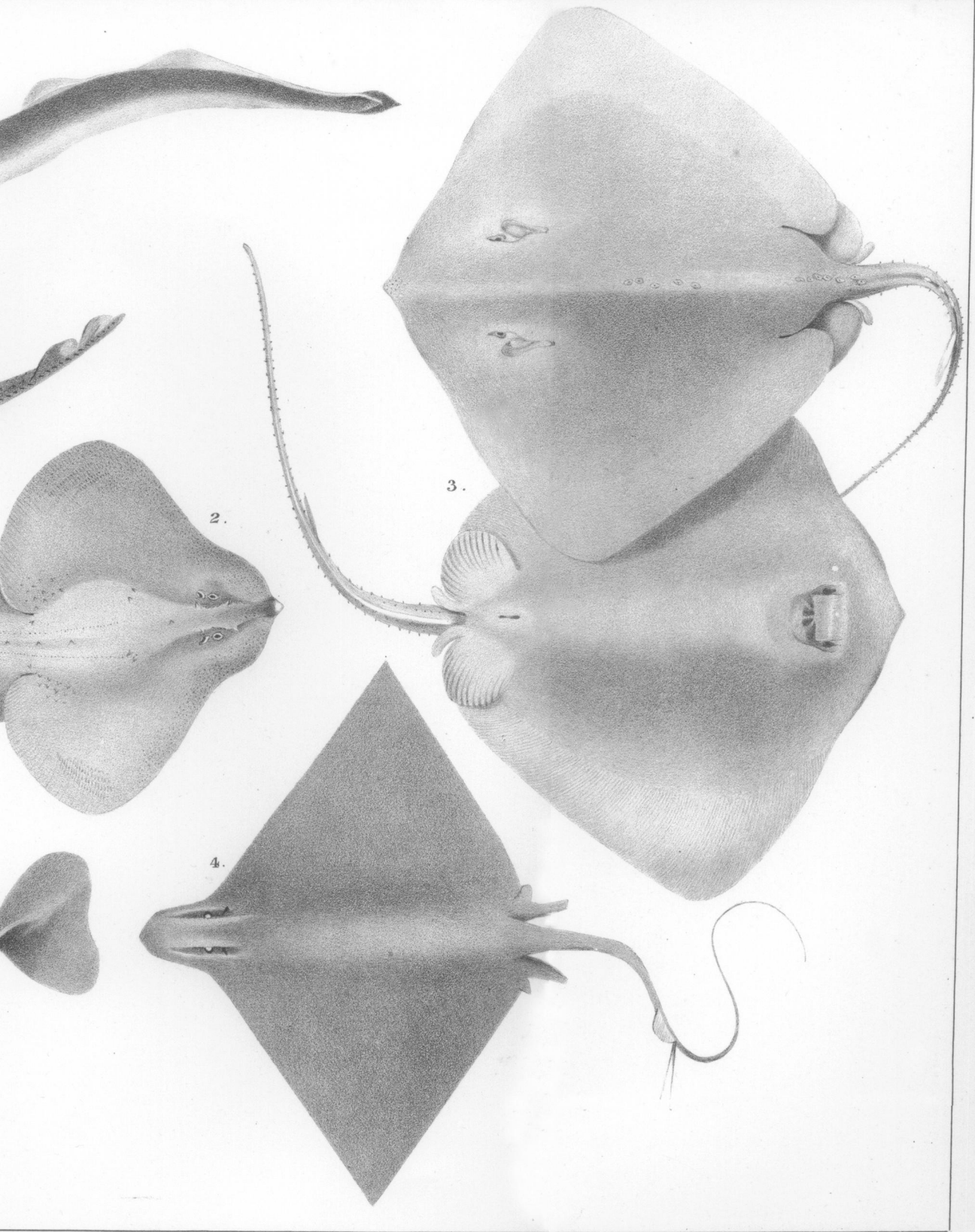


6 a.



1. *Raia diaphanes*, Mitch.  
2. *Raia laevis*, Mitch.

3. *Pastinaca hastata*, DeKay.  
4. *Myliobatis acuta*, Ayres.



3. *Pastinaca hastata*, DeKay.  
4. *Myliobatis acuta*, Ayres.

5. *Torpedo occidentalis*, Storer.  
6. *Petromyzon nigricans*, Lesueur.  
6 a. Mouth.

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